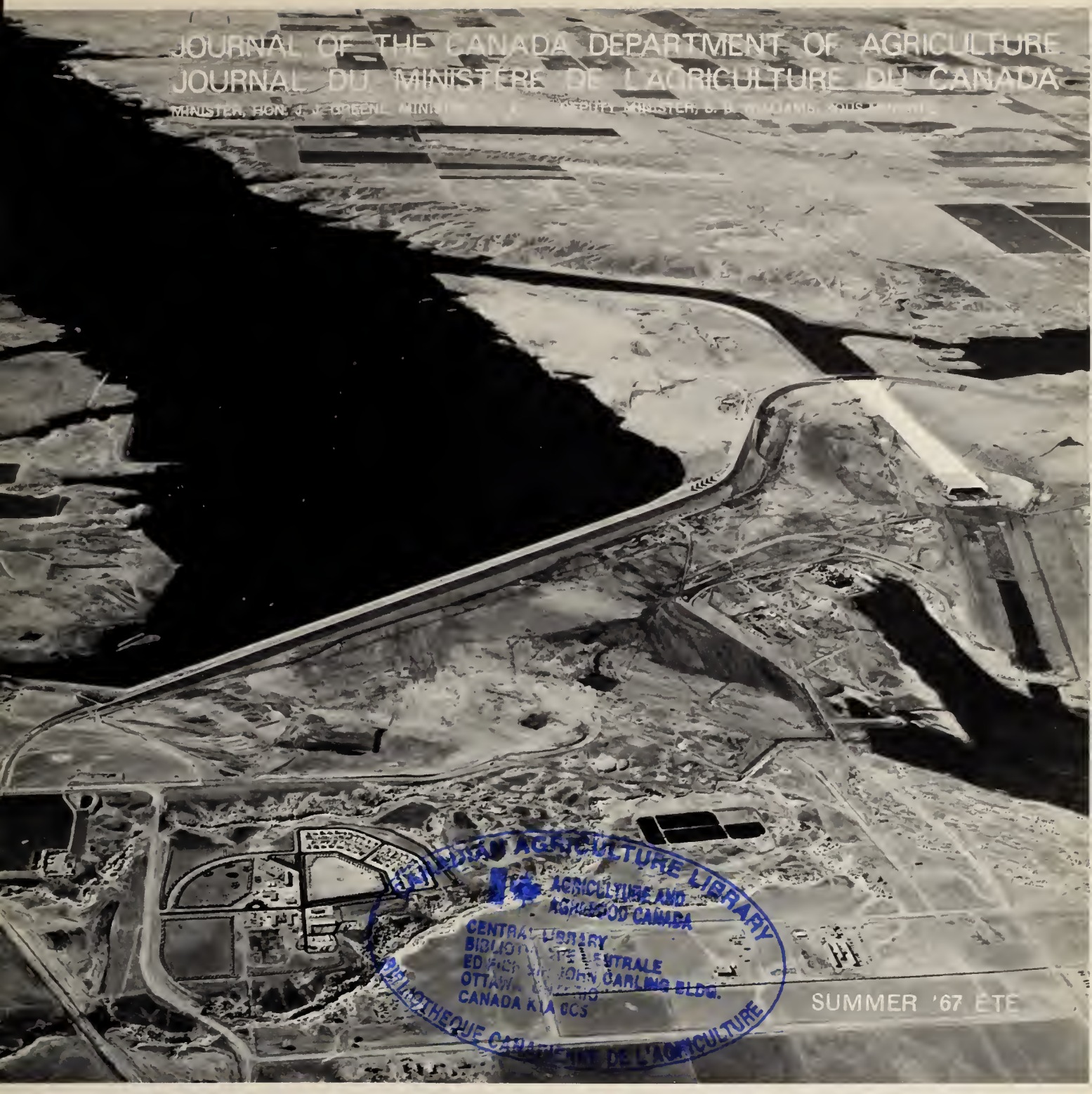
JOURNAL OF THE CANADA DEPARTMENT OF AGRICULTURE
JOURNAL DU MINISTÈRE DE L'AGRICULTURE DU CANADA



CANADIAN AGRICULTURE LIBRARY
AGRICULTURE AND AGRI-FOOD CANADA
CENTRAL LIBRARY
BIBLIOTHÈQUE CENTRALE
JOHN CARLING BLDG.
OTTAWA
CANADA K1A 0C5
BIBLIOTHÈQUE CANADIENNE DE L'AGRICULTURE

SUMMER '67 ÉTÉ

CANADA AGRICULTURE

COVER PHOTO—Power, irrigation, flood control, industrial and municipal water supply, recreation---this is the future ahead of the Gardiner Dam, officially dedicated July 21, 1967.

PHOTO SUR LA COUVERTURE—Fournir de l'énergie et de l'eau d'irrigation, prévenir les inondations, approvisionner les industries et les municipalités, servir à des fins récréatives, voilà le rôle prometteur réservé au barrage Gardiner, officiellement ouvert le 21 juillet 1967.

"Canada Agriculture" is published quarterly by the Canada Department of Agriculture. Its purpose is to help keep extension workers and agri-businessmen informed of developments in research and other federal agricultural responsibilities as carried on by the various units of the Department.

Contributors, namely, professional personnel in the Department's Research, Economics, Health of Animals, and Production-Marketing Branches, Special Act Administrations (PFRA, etc.), and the Farm Credit Corporation are invited to submit their articles in either English or French.

Contributions should be addressed to the Secretary, Editorial Board, Information Division, Canada Department of Agriculture, Ottawa.

Material appearing in "Canada Agriculture" is public property. Any article may be reproduced with proper identification without special permission, but must not be associated with advertising material. Where excerpts only are to be used, permission of the authors should first be obtained.

The use of trade names in articles published in this journal implies no endorsement of the products named nor any criticism of similar products not mentioned.

«Canada Agriculture», publié par le ministère de l'Agriculture du Canada, paraît tous les trois mois. Ce journal a pour objectif de renseigner sur l'activité des Directions du ministère, les agronomes et les hommes d'affaires intéressés à l'agriculture.

Nos collaborateurs, du personnel professionnel des directions de la recherche, de l'économie de l'hygiène vétérinaire et de la production et des marchés, de l'administration des lois spéciales (ARAP, etc.) du Ministère ainsi que de la Société du crédit agricole peuvent, à leur gré, soumettre des articles en anglais ou en français.

Adresser toute communication au secrétaire du Comité de la rédaction, Division de l'information, ministère de l'Agriculture du Canada, Ottawa.

Les articles qui paraissent dans «Canada Agriculture» sont la propriété du public. Ils peuvent etre reproduits sans permission spéciale à condition d'en indiquer la source mais ne doivent faire partie d'aucune réclame. Lorsqu'on ne cite qu'un extrait il faut d'abord en avoir obtenu la permission de l'auteur.

L'emploi de noms commerciaux dans ces articles ne constitue pas l'approbation du produit nommé, au détriment de produits semblables qui ne sont pas mentionnés.

CANADA AGRICULTURE

JOURNAL OF THE CANADA DEPARTMENT OF AGRICULTURE - OTTAWA
JOURNAL DU MINISTÈRE DE L'AGRICULTURE DU CANADA - OTTAWA
MINISTER, HON. J. J. GREENE, MINISTRE DEPUTY MINISTER, S. B. WILLIAMS, SOUS-MINISTRE

Low temperatures control insects in stored foods 2
Milk production costs in major British Columbia areas 5
The nematode diagnostic and advisory service in Ontario 8
Swine Record of Performance 10
Contrôle d'aptitudes des porcs 10
Tall oatgrass 14
Echo 16
A look at the future—beef cattle and hogs 18
Storing Bartlett pears 22
Factors affecting grass seed yields 24
Winter Wheat losses caused by Streak Mosaic 26
Developing late fruiting strawberry varieties 30

VOL. 12 SUMMER 1967 NO. 3

VOL. 12 ÉTÉ 1967 N° 3

EDITORIAL BOARD
COMITÉ DE LA RÉDACTION

Chairman Emeritus, S. J. Chagnon, Président Emérite
Chairman, G. M. Carman, Président
J. C. Woodward
C. R. Phillips
R. J. McClenaghan
Christine E. Rice
G. P. Boucher
Secretary, C. H. Kenney, Secrétaire

LOW TEMPERATURES CONTROL insects in

F. L. WATTERS

One of the good things about Canadian winters is that they control insects. We rely on low temperatures more than any other control measure to protect stored foods from insect infestations. Yet farmers, grain handlers, and food processors seldom make full use of winter weather as an insect control measure. Part of our research program at the CDA Research Station, Winnipeg, is to find more effective ways of using low temperatures to control insect pests. This article reviews briefly some of this work.

The term low temperature, as used here, refers to any temperature below the minimum for insect reproduction and growth. Insects do not have the efficient temperature regulating mechanisms possessed by humans. Instead, their body temperatures follow closely the temperatures of their surroundings. They are therefore much more dependent on their environment for survival. Most stored-product insects do not survive for very long if they are kept at temperatures much below the range at which they usually live. They are most active between 65° and 95° F., and lay most eggs and develop most rapidly between 75° and 95° F. Few stored-product insects reproduce below 60° F. and the majority become immobile at about 40° to 50° F. At 30° to 35° F., several species of stored-product insects die in 3 to 10 weeks. They die more rapidly at lower temperatures, some species being more susceptible to cold than others. In experiments with rusty grain bettles, we found that all adults died in 7 weeks in wheat of 13.5 percent moisture content stored at 35° F. They took one to two weeks longer to die in wheat of 16 percent moisture content.

Low temperatures are utilized in two ways to protect stored foods from insect damage. (1) The infested foods are cooled to a temperature sufficiently low to kill the insects. To use this method effectively we must know the temperatures and exposure periods needed to kill all stages of each pest species. (2) Foods may be stored at temperatures too low for insect reproduction and growth. These temperatures may not be low enough to cause death but they will protect the food from insect damage.

STORED GRAIN

Abundant harvests and low delivery quotas make it necessary for farmers to store large quantities of grain on their farms. Insect problems often occur after grain has been harvested during warm, humid weather, particularly if it has not been protected from infestation. During winter, small bulks of grain cool rapidly but larger bulks cool unevenly from the outside toward the center. Moisture is carried upward from the center of the bulk and condenses on the cold grain at the surface. Molds grow and the grain begins to heat. Insects invariably move to moist, warm regions where they multiply and produce more heat.

It seems a paradox that grain heats mostly during cold winter weather. These hot spots can be found easily by probing the grain with metal rods. The rod can be readily checked for warmth after it has been in the grain for about a minute. Whenever a hot spot is located, immediate steps can be taken to cool the grain and check the infestation. Sometimes it is necessary only to rake or shovel the surface layers. But if

Dr. Watters specializes in the biology and control of stored-product insects at the CDA Research Station, Winnipeg, Man.

STORED FOODS

the grain has not been examined regularly and heating is at an advanced stage, the grain will have to be augered to another location or bin. In our experiments, we found that grain cooled most rapidly when it was mixed with cold grain surrounding the hot spot. Very little additional cooling took place when it passed through the auger. After heating grain has been transferred to a new location the surface cools rapidly. Another transfer after a day or so will cool the grain further (see Fig. 2). Small grain bulks have high surface area to volume ratios and cool rapidly. This is why grain stored in 1000-bushel granaries has a lower average temperature than grain stored in elevator annexes.

Aeration equipment in grain bins is used to circulate cold air through grain. Grain aerators are used extensively in the United States but not in Canada. Greater use of such equipment here would ensure more rapid and uniform cooling of grain during winter. If it becomes necessary to fumigate grain the aerator may also be used to distribute fumigant gases more uniformly.

FLOUR MILLS

Flour beetles infest a variety of cereal foods but cause most trouble in flour mills. These insects occur mainly in milling machinery. Fumigants must be applied at least once a month to control infestations. Some mills require a general fumigation of the entire mill each year. In the Prairie Provinces, mill 'freeze-outs' are as effective as fumigation for controlling infestations. 'Freeze-outs' are so effective that milling equipment need not be fumigated for several weeks or months afterwards. We have found that extremely low temperatures are not necessary for satisfactory control of mill insects. In one of our experiments, we obtained complete mortality of test insects in 38 out of 40 locations in a mill, although temperatures were never lower than −20° F. and fluctuated around 0° F. during the 3-day 'freeze-out'. The data showed that open locations such as cleaned elevator boots cooled to lower temperatures than boots that contained flour.

Some disadvantages of mill 'freeze-outs' often become apparent after the mill resumes operation. These

Fig. 1—Iron rods may be used to check stored grain for hot spots

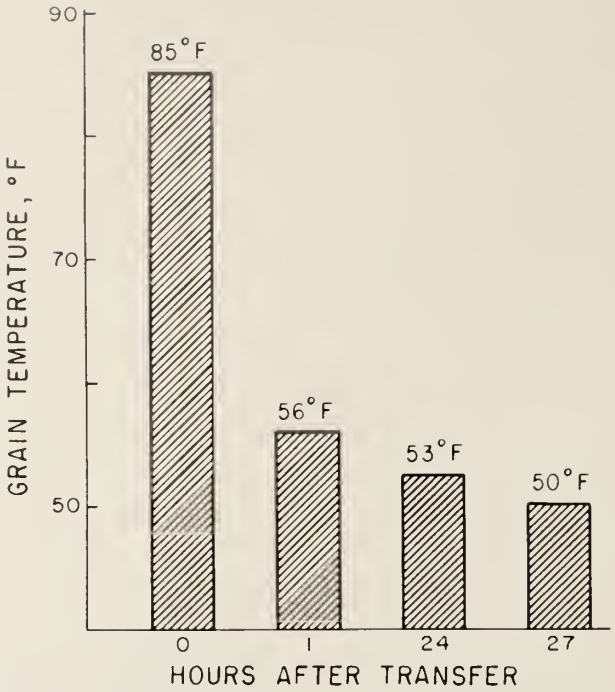
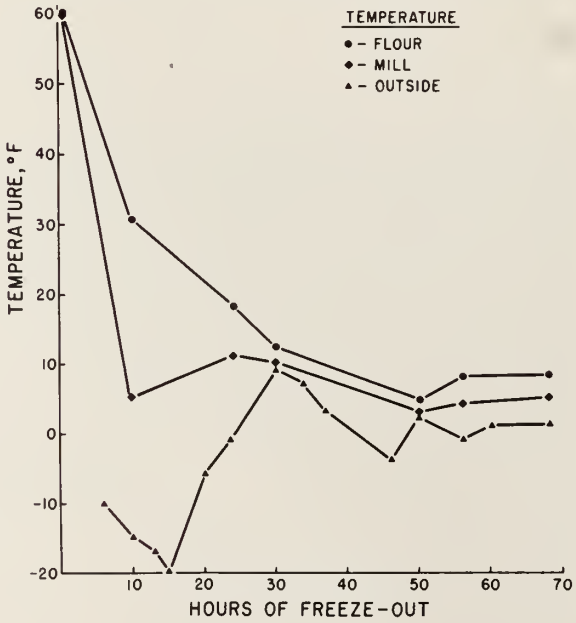


Fig. 2—Heating grain can be cooled by transferring it with an auger during cold weather. The grain cooled most rapidly (from 85° to 56° F.) when it was first augered. Turning the grain in an elevator 24 hours later lowered the grain from 53° to 50° F. Outside air temperatures were 20° to 40° F

Fig. 3—Temperatures inside and outside a flour mill during a winter freeze-out at Winnipeg. Flour temperatures in milling equipment remained higher than air temperatures in the mill



are: (1) old milling equipment usually requires frequent attention and repair; (2) steam pipes that have not been completely drained prior to 'freeze-out' may develop leaks; (3) conveyor belts may break; (4) insects in boiler rooms and in well insulated areas under flour and feed stocks survive and may reinfest the mill.

WAREHOUSES

Low winter temperatures restrict insect movement and prevent infestations of stored foods in warehouses. Although most warehouse pests are killed during the winter, some insects survive under the floor and in areas protected from extremely low temperatures.

We have found that flour beetle eggs do not hatch if they have been kept at 42° F. for 2 weeks. Larvae, pupae, and adults take longer to die. In the Prairie Provinces, warehouse temperatures may go much lower than 42° F. and insects in exposed locations are killed rapidly. Longer exposures are needed to kill insects in flour and other cereal foods where they are insulated from extreme fluctuations of temperature. Storage of freshly milled flour in unheated warehouses during winter is an inexpensive way to prevent infestations.

INFESTATION IN HOMES

Stored food pests often find their way into homes. Since these insects attack a variety of foods, a single infested package may become the source of infestations in other foods. When an infestation is discovered, it is a common practice to destroy all cereal foods whether or not they are infested. During winter, we can control insects in food packages by exposing them to low outdoor temperatures; alternatively, a household Deepfreeze may be used. We have found that all stages of flour beetles in 5-pound sacks of flour were killed after exposure for 24 hours in a Deepfreeze kept at −2° F.

PROTECTION OF FOODS

In today's world, we hear much about the need for food production but less about food preservation. Insects, mites, and molds take their toll of food from the time it is produced until it is consumed. Stored foods are national assets that no person or agency can afford to neglect. Unfortunately growers and food merchants often fail to apply all the measures needed to prevent storage losses. Proper sanitation and the application of insecticides are standard practices for protecting stored foods during warm weather. More extensive use of low temperatures should become a standard practice during winter. A more vigorous approach toward controlling storage pests throughout the year will minimize food losses.

A COMPARISON OF milk production costs

IN THE MAJOR AREAS OF BRITISH COLUMBIA

E. D. WOODWARD

The physical characteristics of British Columbia have restricted agricultural development to isolated pockets between mountain ranges. The climatic characteristics of the various agricultural areas vary considerably. Some parts of the west coast have annual precipitation in excess of 150 inches a year and are characterized in the natural state by dense evergreen forests, whereas two or three hundred miles inland are found areas of sagebrush and cactus with total annual precipitation of nine or ten inches. Similar wide variations exist between districts with respect to mean temperatures and length of growing season.

Climatic differences between areas affect not only the type of farming best adapted to the area, but also the special characteristics of each type of farming. Such is the case, for example, in our comparison study of milk production costs in the major areas of British Columbia. Here, in dairying, which is carried on near most centers of population, we found marked regional differences.

Table 1 shows comparative economic data for all areas of the province where there is any concentration of dairy farms. Information is given on the size of herds, the amount of capital required per cow, the current expenses per cow, the milk sold per cow and the costs and receipts per hundred pounds of milk sold.

The author is Officer-in-Charge, CDA Economics Branch, Research Station, 6660 N.W. Marine Drive, Vancouver, B.C.

It was not possible to do all the necessary studies in the same year. The earliest of these studies, the one covering the North Okanagan, is for the year 1960' whereas the most recent studies are for the year 1964. During this time costs have been rising and in any comparison of the different areas some consideration should be given to this.

Examination of the records of a small sample of Fraser Valley farms for the years 1961 and 1964, indicated a rise in costs per 100 pounds of milk during this period of approximately 45 cents. A similar check on a group of Vancouver Island farms indicated increased average costs in excess of 30 cents per hundredweight. Increased costs such as these have probably taken place in all parts of the province during the period 1960 to 1964. However, the relative position of the various production areas would tend to remain the same, especially in the short run.

All areas studied have shown costs low enough to produce milk for the fluid market and, for all practical purposes, will be able to meet any foreseeable demand for fluid milk. The areas of largest production are the Fraser Valley, Vancouver Island and the North Okanagan. Of these areas, only the Fraser Valley and the North Okanagan are able to produce milk for manufacturing purposes at current manufacturing milk prices.

Table 2 shows detailed financial summaries of selected dairy farms in the Fraser Valley and on Vancouver Island for the year 1961. The costs of producing milk on Vancouver Island are higher than those on the adjacent mainland because of the great climatic difference between the southeastern part of the island and the lower mainland. The summer drought on this part of the island is such that pasture and forage production is severely limited except under irrigation. Irrigation is not common because relatively few farmers have access to irrigation water. The island is a deficit area for hay and the freight costs on purchased hay are such that hay prices on the island are much higher than anywhere else in the province. This is the main reason for higher production costs on Vancouver Island than in the Fraser Valley, and while Vancouver Island will be able to produce its fluid milk requirements at the fluid price for the foreseeable future, anyone contemplating milk production on the Island should endeavour to produce the forage required on the farm.

The East Kootenay area, particularly around Creston, is a relatively low cost area. Production is not large because local requirements are not large but, when required, this area is capable of producing a large volume of milk at a cost competitive with elsewhere in the province.

The Prince George-Vanderhoof area, most of Central British Columbia, and the Peace River district are areas of high cost production (comparable in costs with Vancouver Island) because of the severe climate and relatively low capability of the soils to produce forage. The winters are long and more land is required to support a cow than in the other production areas of the province. Some dairy farmers are doing very well in Central British Columbia, but this is because they are receiving a high enough price for milk to supply the fluid market that they are able to meet their relatively high costs.

Among the milk producing districts in Central British Columbia, the Smithers area is outstanding. The average yields of grain and forage are better and milk production per cow is higher than anywhere else in this part of the Province. The farmers in the vicinity of Smithers are producing milk at a low cost and, if the demand increased, some expansion would be possible. However, the total area of land in the Smithers district is not large and therefore it cannot become a significant factor in the milk industry of the province.

The data on costs and returns as presented in this paper are largely single-year data expressed as group averages. Considerable farm-to-farm variability exists in receipts and expenditures due to such factors as size of business, production per cow, crop yields and management. The data presented in Table 2 were grouped to illustrate this variation. The over-all operator's labor earnings for the 92 farms in the Fraser Valley was an average of $1,952 but one-third of these averaged over $4,400. Again, in the Vancouver Island survey, the 48 farms had average operator's labor earnings of $1,047 but one-third of these farmers made an average of $3,300 in the year.

In summary, milk production in British Columbia is regional in nature, with each producing area being tied to the local consuming market. The Fraser Valley produces about seventy-five per cent of the total milk output and about one-half of this goes into manufacturing. Although average costs of production differ among areas, they do not generally differ by more than the cost of transporting milk from other areas. In the higher cost producing areas, producers are able to obtain higher prices, generally, to offset this. The longer term outlook for milk production in British Columbia is for concurrent expansion as population increases.

REFERENCE

The Dairy Industry in British Columbia:
A study prepared at the request of the British Columbia Department of Agriculture by the Economics Branch, Canada Department of Agriculture, and the B.C. Government Bureau of Economics and Statistics, Sept. 1966.

TABLE 1—AVERAGE COSTS OF PRODUCING MILK ON DAIRY FARMS IN SELECTED AREAS OF BRITISH COLUMBIA, 1960-64

Area	Year of Study	Cows per Farm	Capital Investment per Cow	Current Expenses per Cow	Milk Sold per Cow	Cost per 100 lbs. of Milk[a]	Milk Receipts per 100 lbs. of Milk Sold
		no.	$	$	lbs.	$	$
North Central B.C.–Smithers	1963	24.7	1,863	273	8,006	3.78	4.43
Fraser Valley	1961	28.1	2,107	304	9,507	3.80	4.30
North Okanagan	1960	18.0	2,301	246	7,915	4.04	4.17
East Kootenay (Creston, Cranbrook, Golden)	1964	29.4	1,804	337	9,051	4.24	4.89
West Kootenay (Nelson & Trail)	1964	40.9	1,116	291	7,587	4.36	4.90
Peace River–North	1964	28.2	2,777	301	7,550	4.69	5.49
Vancouver Island	1961	28.1	1,970	346	8,876	4.77	4.95
North Central B.C.–Prince George	1963	23.8	2,033	259	7,164	4.87	4.50
Peace River–South	1964	19.0	2,110	280	6,738	5.09	5.39

[a] Excluding the value of the operator's labor.

TABLE 2—FINANCIAL SUMMARIES FOR SELECTED BRITISH COLUMBIA DAIRY FARMS, 1961

	Fraser Valley				Vancouver Island			
	Operator's Labor Income			All Farms	Operator's Labor Income			All Farms
	High	Medium	Low		High	Medium	Low	
				Total				Total
Number of farms	31	30	31	92	16	16	16	48
		dollars per farm		Aver.		dollars per farm		Aver.
Current receipts								
Milk sales	16,013	9,625	8,697	11,465	15,171	10,282	11,621	12,358
Livestock sales	1,711	791	805	1,106	1,049	636	981	888
Other cash receipts	744	554	377	558	810	137	409	453
Total current receipts	18,468	10,970	9,879	13,129	17,030	11,055	13,011	13,699
Capital receipts	335	212	630	394	482	314	252	349
Inventory increase	4,792	2,045	1,615	2,826	3,376	2,990	3,727	3,364
Total receipts	23,595	13,227	12,124	16,349	20,888	14,359	16,990	17,412
Current expenses								
Crop expenses	661	331	352	449	813	499	613	642
Feed purchases	4,049	2,871	2,711	3,214	4,808	3,860	4,768	4,479
Livestock purchases	1,341	381	669	801	218	383	707	435
Other livestock expenses	835	639	605	694	685	508	606	600
Equipment expenses & custom work	1,433	822	1,118	1,128	1,362	1,064	1,340	1,255
Hired labor	1,333	689	603	877	1,936	663	1,313	1,304
Real estate expenses	1,584	708	720	1,007	700	584	736	674
Other current expenses	433	345	358	379	413	234	392	346
Total current expenses	11,669	6,786	7,136	8,549	10,935	7,795	10,475	9,735
Capital expenses	4,398	2,142	2,098	2,887	3,701	3,348	4,127	3,725
Inventory decrease	37	105	567	238	73	52	303	143
Total farm expenses	16,104	9,033	9,801	11,674	14,709	11,195	14,905	13,603
Family farm income	7,491	4,194	2,323	4,675	6,179	3,164	2,085	3,809
Interest on investment	2,930	2,416	2,595	2,649	2,999	2,231	3,085	2,772
Unpaid family labor	627	633	817	693	413	449	881	581
Operator's labor income	3,934	1,145	−1,089	1,333	2,767	484	−1,881	456
Perquisites—farm products	309	247	220	259	262	198	301	254
—use of house	198	429	457	360	328	359	324	337
Operator's labor earnings	4,441	1,821	−412	1,952	3,357	1,041	−1,256	1,047

THE NEMATODE DIAGNOSTIC AND ADVISORY SERVICE

J. L. TOWNSHEND

1

It's a fact! Nematode diagnoses are helping to combat crop losses in Ontario. Such soil examinations often reveal the presence of plant-attacking nematodes which can cause serious crop losses. And here's another fact: These tiny pests can cause serious crop losses that may be controlled by cultural and chemical methods.

Awareness of crop losses to nematodes is the result of years of research. Scientists at our Harrow and Vineland Ontario Research Stations have determined the role of nematodes in many agricultural problems. For example, the root lesion nematode is involved in such crop diseases as brown root rot of tobacco, peach replant failure, rusty root of celery, and black root rot of strawberry.

For the past decade, Extension specialists of the Ontario Department of Agriculture and Food, and nematologists of the Canada Department of Agriculture have been asked by growers to check their soils for nematodes. Because of the number of such requests, the Ontario Nematode Diagnostic and Advisory Service was established in 1965. For a fee, the Ontario Department of Agriculture and Food analyzes soil samples for the presence of nematodes. CDA scientists doing research on nematodes provide professional guidance to those making the analyses and recommendations.

TAKING THE SOIL SAMPLE

Growers who want their soil tested for nematodes contact the nearest office of the Extension Branch, Ontario Department of Agriculture and Food. The Extension Specialist takes the sample, completes a

The author is a nematologist at the CDA Research Station Vineland Station, Ont.

2

Fig. 1—Stunted table beets in a field infested with the sugar beet cyst nematode

Fig. 2—Response of tobacco on chemically treated soil. Right: plants grown on soil treated with D-D. Left: plants grown on untreated soil the roots of which are damaged by the root lesion nematode

questionnaire and collects $3.00 per sample. In the questionnaire the grower's name and address are recorded along with the sample site, present crop, cropping and fumigation history, future crop, soil type and topography. Health of the present crop and soil drainage are also assessed. These details assist in making recommendations for nematode control.

With field crops, the soil sample is taken from just inside the diseased area of the field, since more nematodes can be extracted there than from areas where plants have dried out. With orchard crops, a sample is taken from the drip line of trees where feeder roots are more abundant. The soil, about two or three pounds, is placed in a polyethylene bag to prevent it from drying and killing the nematodes. It is sent to the CDA Research Station, Vineland Station where the actual analysis takes place.

PROCESSING THE SOIL SAMPLE

Three methods are used to extract nematodes from the soil. First, the soil sample is divided into three portions. The first is spread on a layer of tissue paper in a pan containing a small amount of water. Certain migratory types of nematodes will leave the soil and pass through the layer of tissue paper into the water below where they are collected.

The second is suspended in water where the particles settle to the bottom of the container. The water, which will contain most of the smaller nematodes, is poured off and passed through very fine screens that trap these tiny pests.

The third is first dried and then washed into a tall

N ONTARIO

can filled with water. Certain types, called cyst nematodes, will float to the surface of the water while the soil sinks to the bottom. These cysts can then be skimmed off.

The nematodes recovered by all three methods are then placed in small dishes of water and put under a microscope for examination.

MAKING THE RECOMMENDATION

The kinds and numbers of plant parasitic nematodes recorded with the microscope are entered in a diagnostic and advisory report. If it is the opinion of the nematologist that plant parasitic nematodes are a problem, a recommendation for their control is also made on the report. Two copies of this are then returned to the Extension Specialist. He takes one copy to the grower and discusses the diagnosis and recommendations with him.

Chemical treatment of the soil (fumigation) is recommended for crops of high cash value. Usually soil is fumigated in the fall, but with tobacco, it must be treated in the spring. Because almost all soil fumigants are toxic to plants, the chemical is applied before planting. The area to be treated should be in seedbed condition with the plant debris well rotted. Soil temperature should be above 50°F and the soil fairly moist. Soil fumigants are usually applied by custom operators using cultivator-type injectors. The fumigant is sealed in the soil by irrigation or with cultipacker.

In established orchards where individual trees have died, tree sites are fumigated. The tree and debris are removed, the soil worked well and the fumigant applied by hand injection in the fall. If a new orchard is to be planted in the spring, the area is worked as described and strips corresponding to the tree rows fumigated the preceding fall.

Clean fallowing and crop rotation are recommended for crops of low cash value or for certain nematodes that are difficult to control with chemicals. Fallowing rids fields of weeds on which many nematodes can multiply. A great number of these pests die as the soil dries during fallowing. Crops recommended for rotation are selected either because the nematode will not multiply on them or will do so at a slower rate than on the normal host crops.

The Nematode Diagnostic Service is now meeting the needs of Ontario farmers. Hundreds of samples have been processed through this service and thousands of acres of the province's richest farmlands are now treated annually for nematode control. The Service is expected to grow in the years ahead to keep up with the needs of Ontario agriculture.

Fig. 3—Tall can for the extraction of cyst nematodes

SWINE
RECORD OF PERFORMANCE

Changes in the ROP Program Reflect Increased Interest as Number of Pigs Entered Reached a New High in 1966.

The number of pigs entered in Record of Performance tests reached a new high in 1966. ROP for swine is a free federal program, started in 1929, which gives the hog producer information he can use to improve his breeding stock.

The increased interest in ROP for hogs probably reflects interest in the new livestock classifications at agricultural fairs and exhibitions—introduced in 1965—which require certain entries to have official performance records. But greater significance also attaches to ROP since, late in 1965, it began to publish more profit-related data from the tests.

ROP reporting was switched at the same time to a calendar year basis and 1966 was the first such year for which all the new data are available.

Some 2,179 groups of four pigs each, from all provinces except Newfoundland, were tested, compared with 1,519 in 1965. Those that passed through federal testing stations numbered 1,126 groups (927 in 1965) and those tested on the owners' farms (home tests) numbered 1,053, almost double the 592 reported for 1965.

INDUSTRY'S DECISION

Changes in recording the results of hog testing followed the industry's decision that in appraising the value of a carcass, more direct emphasis should be placed on the yield of cuts it will produce for the retailer to sell over the counter. This meant changing the old scoring system for carcasses that allowed 20 points for length, 30 for back fat, 30 for loin, and 20 for belly.

CONTRÔLE D'APTITUDES DES PORCS

Les changements apportés au programme du contrôle d'aptitudes reflètent un intérêt accru. Le nombre de porcs inscrits en 1966 a atteint un nouveau sommet.

Le nombre de porcs inscrits aux épreuves du Contrôle d'aptitudes a atteint un nouveau sommet en 1966. Le Contrôle d'aptitudes des porcs est un programme fédéral gratuit qui a débuté en 1929 et qui donne aux producteurs de porcs des renseignements qu'ils peuvent utiliser pour améliorer leurs troupeaux d'élevage.

L'intérêt accru que l'on porte au contrôle d'aptitudes des porcs provient probablement de l'attention accordée aux nouveaux classements des bestiaux aux foires et expositions en 1965. Ces classements exigent que certaines classes d'animaux exposés possèdent un certificat d'aptitudes officiellement contrôlées. Mais on accorde aussi plus d'importance au contrôle d'aptitudes, depuis la fin de 1965, alors qu'on a commencé à publier des données obtenues aux épreuves et qui établissent des rapports avec les profits.

En même temps, on a adopté l'année civile pour les rapports du contrôle d'aptitudes; 1966 a été la première année pour laquelle les données entièrement nouvelles ont été disponibles.

En 1966, on a soumis aux épreuves quelque 2,179 groupes de quatre porcs chacun, comparativement à 1,519 en 1965; ces porcs provenaient de toutes les provinces à l'exception de Terre-Neuve. Les épreuves aux stations d'essai du gouvernement fédéral s'élevaient à 1,126 (927 en 1965), et les épreuves à domicile atteignaient le chiffre de 1,053, soit presque le double des 592 signalées en 1965.

DÉCISION PRISE PAR L'INDUSTRIE

On a apporté des changements dans la façon d'enregistrer les résultats de l'épreuve de contrôle d'aptitudes des porcs. À la suite de la décision prise par l'industrie en vue d'évaluer les carcasses on insistera davantage sur le rendement des morceaux qu'elles

The combined index for maturity and yield has been changed in favor of separate indexes for these factors. The result is more information. For instance, the national average performance for all breeds at the end of 1966 is given on ROP forms as follows:

Estimated yield of trimmed cuts—78.6 per cent of warm dressed carcass weight;
Age at which slaughter weight of 155 pounds was reached—172 days;
Feed consumed for each pound of live weight —3.25 pounds.

These three basic figures are established for each quarter and are re-calculated for each year. They are included in the selected test reports sent to breeders who can see at a glance how their hogs compare with the national average. In one column is given the percentage by which his pigs are better or worse than the national average in yield and maturity.

NATIONAL AVERAGES IMPROVING

ROP national averages are steadily improving, though in assessing their importance it must be remembered that they are based on a very small percentage of the Canadian swine population. Approximately one-third of purebred breeders are in the program.

In the last half of 1966, percentage yield of trimmed cuts improved to 78.6 per cent, which is 0.3 per cent better than in the last half of 1965. No earlier comparisons are available for this factor. Feed required per pound of live gain improved from 3.29 to 3.25 over the same period, and this compares with 3.62 in 1957. Age to maturity was unchanged over the last two years from 172 days, but this compares strikingly with 184 days in 1957.

The extent to which purebred ROP boars and dams are used by commercial hog producers to upgrade

H. Lloyd Yeo looks over a group of hogs in the CDA's Record of Performance testing pens at Charlottetown, P.E.I. The department regularly publishes the results of tests of progeny of purebred ROP boars and dams for the benefit of commercial hog producers who may wish to upgrade their own herds

M. Henry Lloyd Yeo surveille un groupe de porcs soumis à une épreuve d'aptitudes (ROP) effectuée par le ministère de l'Agriculture du Canada dans les partitions de la porcherie à la Ferme expérimentale de Charlottetown, Île du P.É. Le Ministère publie régulièrement les résultats des épreuves de progéniture de truies et de verrats de race soumis aux essais ROP en vue d'aider les producteurs commerciaux désireux de relever les aptitudes et la qualité de leurs troupeaux de porcs

permettront au détaillant de vendre au comptoir. Cela exigeait la modification de l'ancien système de notation qui accordait 20 points pour la longueur, 30 points pour le lard dorsal, 30 points pour la région des reins et 20 points pour la poitrine.

L'indice combiné pour la maturité et le rendement a été changé en faveur d'indices séparés pour ces facteurs. Le résultat permet d'obtenir plus de renseignements. Par exemple, l'aptitude nationale moyenne pour toutes les races, à la fin de 1966, est donnée comme il suit sur les formules du contrôle d'aptitudes: Estimation du rendement des morceaux parés—78.6 p. 100 du poids de la carcasse chaude à l'abattage; âge auquel le poids de 155 livres à l'abattage a été atteint—172 jours; aliments consommés pour chaque livre de poids vif—3.25 livres.

Ces chiffres de base sont établis à l'égard de chaque trimestre puis calculés à nouveau pour chaque année. Ils sont inclus dans les rapports d'épreuves envoyés aux éleveurs; un seul regard leur permet de se rendre compte de la performance de leurs porcs comparée à celle de la moyenne nationale. Dans une colonne se trouve inscrit le pourcentage de la supériorité ou de l'infériorité de ses porcs par rapport à la moyenne nationale quant au rendement et à la maturité.

AMÉLIORATION DES MOYENNES NATIONALES

Les moyennes nationales du contrôle d'aptitudes s'améliorent continuellement; il faut cependant se rappeler qu'environ le tiers seulement des éleveurs de sujets de race participent au programme.

Au cours du deuxième semestre de 1966, le pourcentage de rendement des morceaux parés s'est amélioré pour atteindre 78.6 p. 100, soit 0.3 p. 100 de plus que celui des six derniers mois de 1965. On ne dispose pas de données plus anciennes pour établir des comparaisons à l'égard de ce facteur. La quantité d'aliments requis par livre d'augmentation de poids

TABLE I—TOTAL HERDS ENROLLED BY BREED AND PROVINCE

TABLEAU I—TOTAL DES TROUPEAUX INSCRITS PAR PROVINCE ET POUR CHAQUE RACE

	Yorkshire	Landrace	Lacombe
P.E.I. Î.P.-É.	40	17	2
N.S. N.-É.	22	11	2
N.B. N.-B.	11	9	1
Que. Qué.	110	22	1
Ont. Ont.	232	49	39
Man. Man.	51	8	23
Sask. Sask.	92	9	32
Alta. Alb.	109	9	48
B.C. C.-B.	18	5	3
TOT.	685	139	151

In addition, seven Tamworth, one Wessex Saddleback, three Berkshire, and four Hampshire herds enrolled for a total of 990. Of these, 381 herds had groups which completed tests in 1966, an increase of 26 over the previous year.

Sept troupeaux Tamworth, un Wessex Saddleback, trois Berkshire et quatre Hampshire ont aussi été inscrits, ce qui porte le nombre global des troupeaux à 990. Parmi ceux-ci, il s'en trouvait 381 qui avaient inscrit des groupes ayant complété les épreuves en 1966, soit une augmentation de 26 sur l'année précédente.

herds is the real test of the value of the program. The steadily rising volume of Grade A hogs marketed can be attributed to better management practices, including greater use of ROP strains.

ANOTHER INNOVATION

The weekly publication to the industry of Selected ROP Swine Results was another 1966 innovation. The results comprised those groups that had a yield of trimmed cuts of 80 per cent or more at 172 days; or 78.6 or better at 158 days. The selections are the top-rated matings in the previous four weeks.

The list fully identifies breed, sire, dam and owner and is valuable to producers looking for their nearest source of stock for herd improvement.

In addition to the selected list there is another weekly publication: "ROP swine test results by province or area". In its recently revised form the publication gives more information than formerly. It lists total fat, area of loin, percentage of ham in the side, percentage of lean in the ham face, and the important percentage yield of trimmed cuts, which is calculated from these factors. Regional as well as national averages are given so that the breeder and producer can check the performance of his herd in the area where it is marketed and where generally his nearest source of stock improvement lies.

The areas are the Maritimes, Quebec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia. So far B.C. listings have been included under Alberta because that is where they have been tested.

vif s'est améliorée, passant de 3.29 à 3.25 au cours de la même période, et elle se compare à celle de 3.62 livres en 1957. L'âge de l'arrivée à maturité n'a pas varié au cours des deux dernières années, soit 172 jours, mais il se compare très avantageusement à celui de 184 jours en 1957.

L'utilisation par les producteurs commerciaux de verrats et de truies de race, qui ont subi le contrôle d'aptitudes constitue le vrai critère de la valeur de ce programme. Le volume sans cesse croissant des porcs de la catégorie A peut être attribué à l'amélioration des méthodes de gestion, y compris une plus grande utilisation des lignées mises en vedette par le contrôle d'aptitudes.

UNE AUTRE INNOVATION

Une autre innovation, en 1966, a été la publication hebdomadaire pour l'industrie des résultats choisis du contrôle d'aptitudes des porcs. Ces résultats portent sur les groupes dont le rendement des morceaux parés atteint 80 p. 100 ou plus à 172 jours; ou 78.6 et plus à 158 jours. Ces sélections comprennent les sujets des portées les mieux cotées des quatre semaines précédentes.

La liste fournit une identification complète de la race, du verrat et de la truie; elle renseigne donc les producteurs qui désirent se procurer des sujets de qualité.

Il existe une autre publication hebdomadaire: *Résultat des épreuves du contrôle d'aptitudes des porcs par province ou région.* Cette publication, donne plus de renseignements qu'auparavant. Elle note le lard global, la région des reins, le pourcentage de jambon dans le côté, le pourcentage du maigre à la face du jambon et l'important pourcentage du rendement des morceaux parés calculés d'après ces facteurs. On y trouve des moyennes régionales, si bien que l'éleveur et le producteur peuvent comparer la performance de leur troupeau avec celle de la région où ils vendent leur production et où se trouve généralement la source la plus rapprochée de sujets de qualité supérieure.

Le partage du pays en régions est le suivant: Maritimes, Québec, Ontario, Manitoba, Saskatchewan, Alberta et Colombie-Britannique. Jusqu'ici les résultats de la Colombie-Britannique étaient combinés avec ceux de l'Alberta; ils seront publiés séparément en 1967.

Les listes provinciales et nationales sont distribuées gratuitement au commerce, et affichées aux centres d'élevage; on peut aussi les obtenir sur demande en s'adressant à la Division des bestiaux.

L'augmentation de 7 p. 100 dans les épreuves en 1966 n'a été rendue possible que par le nombre con-

In 1967 they will be shown separately.

Both the provincial and the national listings are distributed free to the trade and posted at livestock centers, and are available from the Livestock Division on request.

The seven per cent increase in testing in 1966 was possible only because of the large number of tests carried out on owners' premises. Further expansion of home testing activity is anticipated to supplement 471 federal test pens scattered across the country which, at a rate of three tests each a year, can theoretically handle a maximum of 1,413 groups.

Pigs, purebreds only, are accepted from owners for test at not more than 70 days of age. They are fed to market weight and are sold to packinghouses for slaughter. The owner is paid for the pigs commensurate with the going rate. Returns from sale of the finished animals are retained by the federal Department which incurs direct costs of some $40 per litter, not counting the indirect costs in administration and publication.

CDA TESTING STATIONS

CDA testing stations for the Maritimes are located at Charlottetown (32 pens) and Nappan (24 pens), which together handled 154 groups in 1966. In Alberta the stations are at Edmonton, (60 pens), and Lacombe, (65), which together handled 280 groups, of which 40 were sent by British Columbia breeders.

Other CDA stations, with pens and groups handled, are: Quebec: Lennoxville (60), 145; Ontario: Waterloo, (112) 258; Manitoba: University of Manitoba, Winnipeg (60) 125; Saskatchewan: University of Saskatchewan, Saskatoon (58), 164.

Yorkshires, Lacombe and Landrace were the main breeds represented at the station tests in 1966 and Ontario led all provinces in participation.

sidérable des épreuves faites directement chez les propriétaires. On prévoit l'expansion des épreuves faites à domicile pour suppléer aux limitations qu'offrent les 471 parquets d'épreuve fédéraux, dispersés à travers tout le pays et qui, théoriquement, ne peuvent recevoir plus de 1,413 groupes à un taux de trois éprcuves par année.

Les porcs doivent tous être de race pure, et leur âge ne doit pas dépasser 70 jours. On les alimente jusqu'au poids du marché et on les vend pour l'abattage. Le propriétaire reçoit une rémunération basée sur les prix courants. Les recettes tirécs de la vente des animaux finis sont retenues par le gouvernement fédéral qui assume les frais directs de quelque $40 par portée sans compter les frais indirects d'administration et de publications.

STATIONS D'ÉPREUVES

Les stations d'épreuve du ministère de l'Agriculture du Canada pour les Maritimes sont situées à Charlottetown (32 parquets) et Nappan (24 parquets) qui en tout ont reçu 154 groupes en 1966. En Alberta, ces stations se trouvent à Edmonton (60 parquets) et Lacombe (65 parquets); on y a surveillé 280 groupes dont 40 avaient été envoyés par des éleveurs de la Colombie-Britannique.

Les autres stations du ministère de l'Agriculture du Canada, avec le nombre de leurs parquets et des groupes soumis à l'épreuve, sont les suivantes: Province de Québec, à Lennoxville (60), 145; Ontario à Waterloo (112), 258; Manitoba, Université de Manitoba, Winnipeg (60), 125; Saskatchewan, Université de Saskatchewan, Saskatoon (58), 164.

En 1966, les races Yorkshires Lacombe et Landrace ont été représentées en plus grand nombre que toute autre race et l'Ontario vient en tête avec le plus grand nombre de sujets soumis.

TABLE 2—COMPARISON OF R.O.P. SWINE TESTING ACTIVITY FOR THE CALENDAR YEARS 1965 AND 1966

TABLEAU 2—ÉPREUVES DU CONTRÔLE D'APTITUDES DES PORCS POUR LES ANNÉES CIVILES 1965 ET 1966

Province or Area / Province ou région		Station Testing / Épreuve aux stations		Home Testing / Épreuve à domicile		Total / Total	
		1965	1966	1965	1966	1965	1966
Maritime Provinces	Provinces Maritimes	140	154	10	47	150	201
Quebec	Québec	127	145	15	29	142	174
Ontario	Ontario	259	258	497	708	756	966
Manitoba	Manitoba	128	125	15	39	143	164
Saskatchewan	Saskatchewan	130	164	5	29	135	193
Alberta	Alberta	129	240	25	13	154	253
British Columbia	Colombie-Britannique	14	40	25	188	39	228
Canada		927	1,126	592	1,053	1,519	2,179

The total increases in testing activity throughout the country of 660 represents an increase of 43% in the past year.

En 1966, on a soumis aux épreuves 660 groupes de plus qu'en 1965, soit une augmentation de 43 p. 100.

TALL OATGRASS

Has tall oatgrass a place in Canadian farming? This author thinks so, according to his findings at Ottawa.

Tali oatgrass was first taken into cultivation in the 18th century in France ("fromental") from where it spread to Eastern Europe, gaining particular importance there. It is native to the British Isles where a bulbous form was cultivated in the Bronze Age as foodstuff. It is still widespread there, especially in hedgerows but the species has generally not been regarded as an important source of animal fodder. Similarly, although it has been introduced to North America, New Zealand and Australia, it never gained any importance, despite its very rapid growth and leafiness under a wide variety of conditions. The reason usually given is the relative unsuitability of present forms to modern methods of seed harvesting, cleaning and drilling, which was less of an obstacle in the smaller peasant holdings in Eastern Europe. However, the intolerance of tall oatgrass to trampling in comparison to such species as the ryegrasses may be another reason why it is rejected under the intensive grazing systems of oceanic climates.

S.O. FEJER

Tall oatgrass, a commonly grown and highly valued component of meadows in Continental Europe, may have a place in Canadian farming. A main advantage is that it is polyploid, i.e. has multiple sets of chromosomes (carriers of hereditary material) similar to other established Canadian forage species. For this reason, it was included in a series of experiments for yield selection at the Central Experimental Farm, Ottawa, in which it served as a relatively unselected control species.

Most of the data available are drawn from these experiments which are now going to be terminated. One perhaps unexpected result was to draw attention to the potentialities of tall oatgrass as a forage species for eastern Canada. There was a tremendous amount

The author is a specialist in forage genetics, CDA Research Station, Central Experimental Farm, Ottawa, Ontario.

of variability in the introductions received from the New York State Agricultural Experiment Station in Geneva, compared to the relative lack of variability in such species as timothy or bromegrass. Also there was a good response to the three generations of selection for yield, so that the presently available progenies yield very well indeed. There was no season in any year in which tall oatgrass in spaced plantings did not equal or exceed timothy, whether under frequent or lenient cutting systems. In an experimental tall oatgrass sward, one hay cut yielded up to 10,000 lbs. dry matter per acre. Recovery under these sward conditions was poorer than in the spaced plantings, but additional nitrogen given to the swards markedly improved their regrowth.

Particular advantages of tall oatgrass are its out-of-season growth and its good compatibility in mixtures with legumes, especially alfalfa and trefoil. A recent experiment at the Ottawa Research Station, conducted in alternate rows, showed that tall oatgrass is resistant to suppression by other species, without being aggressive, because of its laxly dispersed foliage, which utilizes high proportions of the available sunlight without causing excessive shading to other species.

Objections to the growth of tall oatgrass in the past were mainly directed towards its susceptibility to winter damage, and to its questionable value for animals. On the first point, experience at Ottawa showed that during the recent extremely damaging winters tall oatgrass was less seriously hit than orchardgrass or alfalfa, although some particularly exposed situations were decimated. As to animal acceptance, no difficulties were reported from Europe, and digestibility values determined in the present tall oatgrass material by the Animal Research Institute in Ottawa gave higher values than either orchardgrass or bromegrass.

Because of this species' potential importance in Canada, we also considered the difficulties experienced with the seed characters. The main trouble, shedding of the seed, may be relatively easy to remedy as the wide variation displayed in this character by the present material was found to be heritable, and seed of a variant, received from Germany, showed full retention of the seed. It should be mentioned here, that a related character, retention of the kernels in the glumes, is also desirable, since dehulled kernels were found to germinate very poorly. A certain amount of mechanical rubbing off of the hairs at the bases of the glumes and of the twisted awns at the end of the glumes is desirable for easier cleaning and drilling, but the seeds are exposed thereby to the danger of dehulling. On the other hand, this retention should not go to the other extreme, so that threshing can be done at low speed to avoid injury of the seed. German workers reported genetic variation in hairiness, and selection is in progress there to reduce this source of trouble, but no awnless forms were found as yet, although variation in length and twisting of awns was observed in the present material. In any case, drilling of the presently available seed is reported to be feasible by mixing it with inert material and by use of special sowing wheels.

Selected tall oatgrass stands in spaced planting, harvested end of October

ECHO

NOTES AND COMMENTS FROM THE FIELD

NEW CREEPING RED FESCUE VARIETY—A new and superior variety of creeping red fescue has been developed at the CDA Research Station, Beaverlodge, Alta. Named Boreal, it has been licenced and seed released to growers for multiplication.

Boreal is the product of a breeding program begun in 1956. It is superior in uniformity of height, crown and maturity, and in seed and forage yields, to the Olds variety from which it was developed. Tendency of the roots to creep is about equal in both varieties.

For many years the Olds variety has accounted for almost all of Canada's creeping red fescue seed production. It has long been the most satisfactory variety for turf and pasture purposes. However, its lack of uniformity in maturity and height have made harvesting difficult.

Boreal will reduce harvesting problems. Comparative tests in Alberta proved it to be superior to Olds in uniformity of height, crown and maturity.

Comparisons: Height: Boreal, 20-24 in.; Olds 15-27 in. Crown Width: Boreal, 4-6 in; Olds, 3-8 in. Ripening period: Boreal, 3-5 days; Olds, 5-7 days.

Boreal also out-produces its parent, averaging about six per cent more seed and forage.

Fifty lb. of breeder seed and 450 lb. of Foundation seed have been allocated by the Canadian Forage Seed Project for planting in 1966. Future applications for Boreal seed will be accepted in January of each year by the provincial departments of agriculture.—C. R. ELLIOTT, BEAVERLODGE, ALTA.

PLANT HARDINESS STUDIED—Scientists at the CDA Plant Research Institute Ottawa, Ont., are using electrical methods to test outdoor plants for winter hardiness. To do this, they insert needle-like electrodes into the plant and record the resistance of its tissue to an electric current.

The technique, developed by experts of both the institute and the CDA Engineering Research Service, is desirable because it gives a relative value to plant hardiness.

Three well-known apple varieties were tested: Antonovka, hardy and early-maturing; McIntosh, less hardy and later maturing, and Northern Spy, relatively tender and late-maturing. All were budded on Malus robusta 5 rootstock.

Results: Autumn readings of the season's shoot growth showed a resistance of 21,500 ohms for Antonovka, 16,800 ohms for McIntosh and 13,900 ohms for Northern Spy. Mid-winter readings of twigs of the same varieties were 72,200, 64,300 and 51,000 ohms respectively.

These results show that in a closely-related group of plants, those with higher resistance readings towards the end of the growing season are the earlier-maturing varieties, whereas those with high readings in mid winter are the more winter-hardy varieties.

The technique has been used chiefly with apples so far, but a much wider application is possible in plant research and breeding work.

Exploratory studies indicate that this method of testing for hardiness may be applied to other fruit trees and to over wintering plants such as forsythia, roses, evergreens, forage crops and turf grasses. —J. W. WILNER, OTTAWA, ONT.

CONTROL OF RAGWORT—Tansy ragwort, or Stinking Willie, can be controlled by both cultural and chemical means.

The most effective cultural control is to plow, well-cultivate and fertilize land before re-seeding it to hay or pasture. The resultant heavy sod will discourage germination and establishment of the weed.

For reasonably effective control without breaking and re-seeding the land use well-timed cultural practices and spray with herbicides. Mowing the flowering plants in pastures and meadows periodically ensures some control, since ragwort is usually biennial and dies after flowering in its second year. If damaged by trampling or inadequate spraying, it may persist for several years.

In an infested field, there are usually plants in the seedling, rosette and flowering stages of growth. All plants, therefore cannot be treated at the most susceptible stages of growth.

Good control of ragwort in pastures has been obtained from spraying ester formulations of 2,4-D, from one to two lb. active ingredient per acre, and at the rate of 15 gallons of spray material per acre, in mid-June and again in mid-September.

Repeated treatments are usually necessary the next year, due to reinfestation.

To preserve clover in the sward, replace 2,4-D with 4-(2,4-DB) as a spray, and apply it at from 1.5 to 2 lb. active ingredient per acre in not less than 15 gallons of water.

Ragwort not only reduces yields of forage, but when eaten to excess, is extremely poisonous to livestock. Care must be exercised, therefore, to keep livestock out of treated pastures for several weeks after spraying, because the herbicide makes the ragwort more palatable to grazing animals.—W. N. BLACK, CHARLOTTETOWN, P.E.I.

RASPBERRY NEMATODE PEST—Seven types of parasitic nematodes may be found in Ontario raspberry plantings, but only one is of importance. This is the root lesion nematode, and it occurred in 80 per cent of the raspberry plantings surveyed in 1965 at the CDA Research Station, St. Catharines, Ont.

The difference in the level of infestation was great between sandy and clay soils. Sandy soils contained as many as 1,000 nematodes per pound of soil, compared with 100 per pound in clay soils.

Only raspberry bushes on sandy soils were damaged by the pest. The damage was lack of plant vigor and, more seriously, stunted canes. Roots of the canes were discolored and in many instances the fine feeder roots were missing.

The root lesion nematode can not be controlled in established plantings, but measures can be taken against the parasite when starting new plantings.

Soil fumigation is recommended to kill the nematode species, and this should be done in the fall preceding spring planting. The soil in an area selected for a new planting should be in seed-bed condition and plant debris should be well-rotted. Application is usually by a custom operator, using either Telone or D-D at 18 to 25 gallons per acre, or Verlox at seven gallons per acre.

Only healthy canes, such as those certified virus-free and released by the Ontario Department of Agriculture, should be planted.

Good cultural practices and disease control should supplement this treatment. —J. L. TOWNSEND, ST. CATHARINES, ONT.

FCC LOANS IN 1966-67—The need for long-term mortgage credit in Canadian agriculture is increasing, according to statistics recently released by the Farm Credit Corporation for the fiscal year ended March 31, 1967.

A total of 12,167 loans amounting to $247,947,500 were approved during the 12 month period, compared with 11,238 loans totalling $208,984,900 during the previous year. This is an increase of 8.2 per cent in the number, and 19 per cent in the amount of loans.

Geographical distribution of loans approved during the past fiscal year, with figures for the previous year in brackets, is as follows: British Columbia: 582 (611) loans for $15,017,800 ($14,014,600); Alberta: 2,844 (2,940) loans for $62,408,800 ($58,346,300); Saskatchewan: 3,656 (3,197) loans for $72,046,700 ($56,570,200); Manitoba: 1,122 (899) loans for

The fast-growing data processing service of the Canada Department of Agriculture is now installed in the new Sir John Carling Building in Ottawa. Above, an operator in the Computer Mapping Section is "digitizing" a soil map. The tiny figures she is locating with the magnifying glass are transferred to IBM cards and will indicate soil capabilities on the map being prepared for the Canada Land Inventory.

Opératrice à l'œuvre, au Centre du traitement des données, au ministère de l'Agriculture du Canada, Edifice Sir John Carling. A l'aide d'une loupe elle repère les chiffres minuscules qui seront retransmis sur cartes IBM et serviront à indiquer les possibilités du sol sur les cartes préparées pour l'Inventaire des sols canadiens.

$22,160,200 ($14,879,500); Ontario: 2,042 (2,210) loans for $43,332,600 ($42,695,300) Quebec: 1,522 (1,140) loans for $25,941,200 ($18,987,200); Atlantic Provinces: 399 (241) loans for $7,040,200 ($3,491,800).

The ever-growing demand for long-term credit results from major adjustments taking place in the physical and financial structure of farms and farming techniques, say FCC officials. Such adjustments, they add, are essential for the continued growth and development of the agricultural industry.

The Corporation also lends to groups or "syndicates" of three or more farmers who have entered into an agreement to share in the purchase and use of farm machinery. The object is to help farmers save on machinery overhead costs.

From the start of lending under this program in January last year to the end of March this year, 261 loans were made to 216 syndicates made up of 839 farmers. The total amount loaned was $1,985,989. Loans have been made for a wide range of agricultural equipment which is being successfully used on a cooperative basis.

The Corporation has more than 200 Credit Advisors located in agricultural centers across Canada in order to make its facilities readily available to the farming public.

LE CRÉDIT FACILITE L'ADAPTATION DES FERMES—Les chiffres que la Société du crédit agricole vient de communiquer pour l'année budgétaire terminée le 31 mars 1967 indiquent que le besoin de crédit hypothécaire à long terme augmente de plus en plus dans l'agriculture canadienne.

En tout, 12,167 prêts se totalisant à $247,947,500 ont été approuvés durant cette période de douze mois, comparativement à 11,238 prêts s'élevant à $208,984,900 au cours de l'année précédente. Il s'agit là d'une augmentation de 8.2 p. 100 quant au nombre des prêts et de 19 p. 100 quant à leur montant.

La liste qui suit indique la répartition géographique des prêts approuvés durant la dernière année budgétaire ainsi que les chiffres correspondants pour l'année précédente, entre parenthèses: Colombie-Britannique 582 (611) prêts pour $15,017,800 ($14,014,600); Alberta 2,844 (2,940) prêts pour $62,408,800 ($58,346,300); Saskatchewan 3,656 (3,197) prêts pour $72,046,700 ($56,570,200); Manitoba 1,122 (899) prêts pour $22,160,200 ($14,879,500); Ontario 2,042 (2,210) prêts pour $43,332,600 ($42,695,300); Québec 1,522 (1,140) prêts pour $25,941,200 ($18,987,200); Prov. de l'Atlantique 399 (241) prêts pour $7,040,200 ($3,491,800).

Selon les hauts fonctionnaires de la Société du crédit agricole, la demande toujours croissante de crédit à long terme provient des adaptations importantes qui se produisent dans la structure physique et financière des fermes et dans les techniques agricoles.

Ils signalent que de tels ajustements sont essentiels à la continuation du développement et de la rentabilité de l'industrie agricole.

La Société prête aussi à des groupes ou syndicats de trois cultivateurs ou plus qui ont conclu une entente pour partager le coût d'achat et l'utilisation des machines agricoles. Le but de ces prêts est d'aider les cultivateurs à épargner sur le coût et les frais généraux de la machinerie.

Depuis le début de ce régime de prêts, en janvier 1965 jusqu'à la fin de mars cette année, 261 prêts ont été consentis à 216 syndicats comprenant 839 cultivateurs. Le montant global qui leur a été prêté s'élève à $1,985,989. Les prêts accordés l'ont été pour l'achat d'une grande variété de machines agricoles qui sont utilisées avec succès d'après les principes coopératifs.

La Société dispose de plus de 200 conseillers en crédit, disséminés partout dans les centres agricoles du Canada, en vue d'assurer promptement ses services à la classe agricole.

FIELD PEA BLIGHT CONTROLLED—Blight of field peas is effectively controlled at the seed stage when the seeds are treated with a fungicide. This has been shown by tests carried out over the past three years at the CDA Plant Research Institute at Ottawa. Heavily infested seed and various fungicides were used in the experiments, and excellent control resulted.

Infestation appeared in 46 to 73 per cent of seedlings of untreated seed, but when it was treated with either 75 per cent thiram or 75 per cent captan, blight appeared in no more than four per cent of the plants. In many cases, all seedlings were free from blight.

Other fungicides were used in the tests, but thiram and captan gave the best control. In view of the results, the use of either of these is recommended to treat seeds known to be infected with blight.

Blight is caused by a seed-borne fungus, *Ascochyta pinodes*. In the spring, young seedlings become infected from diseased pea seed and, during the growing season, the infection spreads to healthy plants. Under the right temperature and moisture conditions, blight may spread rapidly and extensively. Crop losses of 40 per cent or more can be expected under these circumstances.—V. R. WALLEN, OTTAWA, ONT.

a look at the FUTURE

BEEF CATTLE

R. K. BENNETT

Cattle in Canada are part of the North American pool and make up about 10 per cent of the combined Canada-United States supply. At present there are about 11.4 million cattle and calves in Canada, approximately 108.5 million head in the USA—a total of about 119.9 million. The 3.3 million beef females in Canada represent 8.0 per cent of the total in both countries, which is 47.1 million.

Canadian cattlemen occupy a unique position in Canadian agriculture—more so than any other segment of farming. They operate on and are part of the North American economy. That is, cattle prices in Canada are tied directly to price levels in the United States. Live cattle and calves may be shipped both ways across the border. This is also the case with respect to dressed beef and veal.

The outlet for Canadian feeder cattle in the United States sets the general levels of feeder prices in Canada at any particular time for this class of cattle. In the last four years, the number of feeder cattle exported to the United States has been approximately as follows:

YEAR	HEAD
1966	297,000
1965	396,000
1964	90,000
1963	157,000

Hence, the United States demand and outlet establishes what might be referred to as a 'floor price' for feeder cattle and calves originating in Western Canada.

With respect to fed cattle, when the supply of marketings in Canada is higher than the domestic market will absorb (at a price level above the equivalent of the export outlet in the United States) fat cattle will move South on export, particularly from southern Alberta to the Pacific Northwest. When this situation prevails fed cattle prices in Canada are on what is referred to as an 'export basis' and the general price level in the United States sets a 'floor' below which prices in Canada do not drop. The export of live cattle for slaughter has not been large over the past four years:

YEAR	APPROX. NO.	PER CENT OF INSPECTED SLAUGHTER
1966	40,000	1.5
1965	57,800	2.1
1964	27,500	1.1
1963	17,500	0.8

When fed cattle prices in Canada are on an 'export basis' the price for Canadian Choice Steers at Toronto in Canadian dollars is about the same as the price level for United States Choice Steers at Omaha in United States dollars. On the other hand, when the supply of fed cattle marketings in Canada is in short supply, the price may move up to a level where United States live cattle or beef may be imported from the United States. For example, in the spring of 1964 when prices at Toronto rose to a sufficiently high level to bring about an 'import basis', over 30,000 slaughter cattle came in from the United States in about a three-month period. This happened again beginning about November 1, 1966 and since then up to January 28, 1967 about 8,900 head came in.

Under such a situation the United States price sets

Mr. Bennett is Director, Livestock Division, CDA Production and Marketing Branch, Ottawa.

TABLE 1—ESTIMATED REQUIREMENTS FOR BEEF

Year	Canada			United States			Canada and United States combined		
		Total			Total			Total	
	Per Capita	Cattle '000	lb. -M-*	Per Capita	Cattle '000	lb. -M-*	Per Capita	Cattle '000	lb. -M-*
1966	83	3,119	1,653	102	34,617	20,078	100.3	37,736	21,731
1975	85	3,928	2,082	105	40,895	23,719	103.0	44,823	25,801
1980	91	4,636	2,457	114	48,214	27,964	111.7	52,850	30,421

*Millions

a 'ceiling' above which prices in Canada do not rise.

When price levels for fed cattle in Canada are on an 'import basis' the price for Canadian Choice Steers at Toronto, in Canadian dollars, is approx. $4.25 per cwt. higher than the price for United States Choice Steers at Omaha in United States dollars.

ESTIMATED BEEF SUPPLY IN 1975 AND 1980

The per capita consumption of beef in 1966 was 83 lb. in Canada and 102 lb. in the United States.

The June 1, 1966 population in Canada was 19,919,000 and in the United States at July 1, 1966 it was 196,840,000—a total of 216,759,000.

For the purpose of this calculation the projections are:

TABLE 2

(a) Population

Year	Canada	United States	Combined
1975	24,500	225,900	250,400
1980	27,000	245,300	272,300

(b) Per capita consumption of beef

	1966	1975	1980
	lb.	lb.	lb.
Canada	83	85	91
United States	102	105	114
Combined	100.3	103.0	111.7

(c) Average weight of beef carcasses
Canada 530 lb. United States 580 lb.

TABLE 3—PERCENTAGE INCREASE OF TOTAL POUNDS AND NUMBER OF CATTLE (APPROXIMATE)

	Canada	United States	Combined
	Per cent	Per cent	Per cent
1975 over 1966	26	18	19
1980 over 1966	49	39	40
1980 over 1975	18	18	18

The per cent increase in inspected slaughter would be about the same as above—inspected slaughter is the main source of beef consumed domestically.

Where will the increased supply requirements (for Canada and the United States) in terms of feeder cattle, come from in the future? Nearly 40 per cent more slaughter cattle will be required in 1980 compared with 1965.

(a) More beef steers;
(b) More beef heifers—particularly from the feeding of a higher percentage of the available supply of beef heifers;
(c) More dairy steers and, to a lesser extent, more dairy heifers.

Where will the increased number of feeder cattle be fed? Primarily in the United States. Western Canada, particularly Alberta, will record a steady increase. But as far as Canada is concerned, the major increase will likely be in Ontario because:

(a) The utilization of corn in fattening beef cattle is rapidly increasing.
(b) Ontario has no obvious disadvantage in competing with Alberta for the available supply of feeder cattle—the climate in Ontario may be more favorable. Freight rates are not a discriminating factor—it costs about the same amount to move a 600 lb. feeder steer from southern Alberta to western Ontario (about $3.00 per cwt.) as it costs to ship a 600 lb. dressed carcass from Calgary to Toronto (600 lb. at about $3.50 per cwt).
(c) In comparison with the cattle feeder in Iowa (US Corn Belt) the feedlot operator in Western Ontario has some advantages with respect to prices received for fed cattle:
    (i) When the price level in Canada is on an 'export basis' the price for Choice steers at Toronto in Canadian dollars is about the same as the price in United States dollars for Choice steers at Omaha. It should be noted that steers of Choice grade in the United States are, on the average, of higher quality and yield than steers of Choice grade in Canada.

(ii) When the price level in Canada is on an 'import basis' then the level for Choice steers at Toronto is about $4.25 per cwt. above the Omaha price for Choice steers. It may be assumed that in the future the price in Canada will be for a considerable proportion of the time each year above the 'export basis' to some degree.

In summary, the Ontario feedlot operator appears to be in a position to put on a pound of gain at about the same cost or less than his counterpart in either Alberta or Iowa.

HOGS

As is the case with cattle, hog prices are directly related to price levels in the United States. Pork products move both ways across the border. Live slaughter hogs cannot be imported into Canada due to the existence of cholera in the United States and there is virtually no movement of live slaughter hogs to the United States because under the Hog Quality Premium Policy $3.00 is paid on each Grade A carcass by the Canada Department of Agriculture.

It should be emphasized that there is one main difference between hogs and fed beef with respect to trade between Canada and the United States—the form in which product moves. Pork carcasses are shipped mainly in the form of wholesale cuts (hams, backs, bellies, butts and picnics, etc.). On the other hand, the bulk of fed cattle move in the 'original' form—either as live cattle or as carcasses (shipped as quarters or major wholesale cuts).

Thus, with fed cattle it is possible to make at any time a direct comparison between price levels in the two countries (prices in Canada may be on an 'export basis', on an 'import basis', or somewhere 'in between'). With respect to hogs, although there is always a direct relationship between the price levels of hogs at Toronto and at Chicago, the pattern is not as clear because at most times pork products are moving in both directions.

Due to what might be termed a difference between the two countries in consumer preference for the various cuts of pork, there is a situation in the United States where hams and backs sell for a higher price in comparison to bellies and shoulder cuts than is the case in Canada. Therefore, there is a continuous outlet in the United States for high quality lean trimmed cuts, particularly hams and backs. The chief export is hams, mainly in the weight range 16 lb. and up, the bulk of which go into the United States Atlantic Seaboard area. Such Canadian hams bring a definite premium, at times as high as ten cents per pound over American hams. In addition, there is a regular trade in canned hams. Back bacon from Canadian hogs is considered a luxury item in the United States due to its high quality. There is also a limited demand for bellies, mainly in the Pacific Coast area of the United

TABLE 4—ESTIMATED REQUIREMENTS FOR PORK

	Canada			United States			Canada and United States combined		
		Total			Total			Total	
Year	Per Capita	Hogs '000	lb. -M-*	Per Capita	Hogs '000	lb. -M-*	Per Capita	Hogs '000	lb. -M-*
1966	48	7,469	956	57	77,847	11,210	56.1	85,316	12,166
1975	50	9,570	1,225	59	92,555	13,328	58.1	102,125	14,553
1980	50	10,547	1,350	58	98,798	14,227	57.2	109,345	15,577

*Millions

States to go into a specialty market. With respect to imports of pork from the United States, there is not any quality advantage involved—in other words, there is not any specific demand for United States product as such, and it does not move into a special market north of the border.

Although the effect of United States hog prices on price levels in Canada is not as clearly defined as with cattle, the United States price does, in effect, at any time provide a 'floor' below which prices do not drop in Canada. On the other hand, the United States price level creates a 'ceiling' which limits the level to which prices will rise in Canada during periods of light marketings.

ESTIMATED PORK SUPPLY IN 1975 AND IN 1980

The per capita consumption was about 48 lb. in Canada and about 57 lb. in the United States in 1965.

The June 1, 1966 population in Canada was 19,919,000 and in the United States at July 1, 1966 it was 196,840,000—a total of 216,759,000.

For the purposes of this calculation the projections are:

TABLE 5

(a) Population

Year	Canada	United States	Combined
		'000	
1975	24,500	225,900	250,400
1980	27,000	245,300	272,300

(b) Per capita consumption of pork

	1966	1975	1980
	lb.	lb.	lb.
Canada	48	50	50
United States	57	59	58
Combined	56.1	58.1	57.2

(c) Average weight of carcasses (pork, consumed as such) per capita
Canada 128 lb. United States 144 lb.

TABLE 6—PERCENTAGE INCREASE IN TOTAL POUNDS AND NUMBER OF HOGS (APPROXIMATE)

	Canada	United States	Combined
	Per cent	Per cent	Per cent
1975 over 1966	28	19	20
1980 over 1966	41	27	28
1980 over 1975	10	7	7

The main source of pork consumed in the United States is from inspected slaughterings. So, the increase in inspected slaughter would have to be about the same as the total increase required by 1980 as projected above. In Canada the major source of pork is from 'Gradings'.

Where will increased supply requirements of hogs (for Canada and the United States) be produced? About 24 million more hogs will be required in 1980 compared with 1966.

Again primarily in the United States, western Canada, particularly Alberta, will show a steady growth.

For Canada the main increase will likely be in Ontario, due to the ever increasing use in eastern Canada of corn in swine rations. It is expected that, with respect to livestock feeds, the main impact of high lysine corn will be in the area of swine production. If this proves to be the case then the competitive position of the Ontario hog producer, compared to the hog producer in western Canada, may be further enhanced.

Due to several factors, the Canadian hog producer has a competitive advantage over his counterpart in the United States Corn Belt:

TABLE 7

(a) Higher annual average price due to average difference in quality

	Toronto	Chicago		Toronto over Chicago
	Grade A	Live[1]	Dressed Equivalent	Dressed Basis
1966	$35.90	$24.81	$33.08	$2.82
1965	33.40	22.30	29.73	3.67
1964	27.30	16.20	21.60	5.70
1963	27.80	16.40	21.87	5.93
1962	29.60	17.52	23.36	6.24
1961	28.30	17.78	23.70	4.60
			6-year simple average =	$4.83[2]

[1]Choice and Good Barrows No. 1, 2 and 3, in weight range of 200 to 220 lbs.
[2]On a 154 lb. carcass (about the present average weight) $4.83 per cwt., is equal to $7.44 per hog.

(b) The Hog Quality Premium Policy
$3.00 for each Grade A carcass paid by the Canada Department of Agriculture.

(c) An export outlet in the United States in a premium market for Canadian hams, and to a lesser extent, backs and bellies.

(d) No outlay for vaccination against hog cholera. The average cost in the United States for vaccination against hog cholera is at least $1.00 per hog.

bartlett pears

HOW TO HANDLE AND STORE FOR BEST RESULTS

S. W. PORRITT

Bartlett pears are a delicate commodity which require careful handling to preserve their fine quality and consumer appeal. This fruit is picked when hard and green, and requires a ripening temperature of 68–70°F to develop good texture and flavor. At temperatures much lower, the fruit becomes yellow but fails to ripen properly, and eventually loses its ability to soften even at 65°F. Thus, as we have found in our studies at the Summerland Research Station, pears not intended for immediate ripening should be stored promptly at 30–32°F, preferably at 30°F, and not at intermediate temperatures. Even with cold storage, pears can be stored too long, with the result that they fail to ripen normally or develop core breakdown as soon as they soften, thus resulting in little or no shelf life. Such failure to keep for the expected length of time generally can be associated with inadequate handling and storage practices. Of all tree fruits which can be stored for an extended period, pears are the most responsive to small differences in holding temperatures. Both grower and cold storage operator must appreciate this fact if the crop is to be handled successfully.

Dr. Porritt is a specialist in fruit harvesting and storage at the CDA Research Station, Summerland, B.C.

PROMPT STORAGE

The grower's first responsibility is to deliver pears to the cold storage as soon as possible after harvest. Research has shown that the length of time pears can be stored satisfactorily decreases proportionately with the increase in time the fruit is held at warm orchard temperatures after harvest.

This is strikingly illustrated by our experiments at the CDA Research Station at Summerland, B.C. Four lots of Bartlett pears from the same tree were held 0, 1, 2 and 4 days at 65°F after harvest, then cooled to 30°F in one day, and held at that temperature for 12 weeks. Following cold storage, the fruit was kept at 70°F for 10 days before examinations for core breakdown. We found that none of the fruit stored immediately after picking had core breakdown, but 26, 52 and 71 per cent of the fruit did have which had been held 1, 2 and 6 days respectively before cold storage.

Our studies have also shown that behavior of pears following harvest is sometimes deceptive. For example, those picked during early harvest may soften either a little or none at all, and exhibit no other obvious signs of ripening for two to three days if held at 60–70°F after picking. However, we discovered that this treatment inevitably has the effect of reducing the potential storage life, causes early yellowing of fruit in cold storage and predisposes fruit to early onset of core breakdown following storage.

RATE OF COOLING

The job of handling pears is only partially completed when the fruit arrives at the cold storage. The grower's efforts to harvest his crop at the correct maturity stage and deliver it promptly to cold storage may be wasted if the fruit cannot be cooled rapidly. Our research has revealed that there is a direct relationship between the speed of cooling and an extension of the storage life of Bartlett Pears. We have found that the incidence of core breakdown varies directly with the length of cooling period. For example, pears cooled to 30°F in one day had 0 per cent core breakdown but those in which the temperature was gradually reduced to 30°F over a period of 14 days had 94 per cent incidence of core breakdown.

Rapid cooling of pears is achieved in cold storages with adequate refrigeration and air circulation, and with careful fruit stacking to permit good air movement between containers. Failure to cool fruit quickly may still occur under these conditions if large quantities of warm fruit are confined to one part of the storage room instead of the load being distributed to different parts of the room.

STORAGE TEMPERATURE

Everyone is aware that fruit ripens rapidly in a warm room. In cold storage, small differences of temperature have a spectacular effect on aging of the fruit. For example, our experiments have demonstrated that the storage life of Bartlett pears was 40 per cent greater at 30°F than at 32°F.

Because pears are not subject to low temperature injury unless actually frozen, storage at 29°F has sometimes been advocated. The freezing point of Bartlett pears is given as 28.0° to 28.5°F but in fact, the range can be greater than this. Therefore, storage of fruit at 29°F, particularly that grown in cool seasons or cool areas when sugar content is low could result in considerable freezing.

Maintaining a fruit temperature of 30°F is practical in modern cold storages and should be used.

Fig. 1—Bartlett scald. The occurrence of this senescent disorder may be delayed by good handling and storage practices

THREE RECOMMENDATIONS FOR HANDLING AND STORAGE

1. Insure that Bartlett pears are placed in cold storage within a few hours of picking.
2. Cool them to 30°F within four days of harvesting.
3. Maintain a core temperature of 30°F during the entire storage period.

C. R. ELLIOTT

To the casual observer, seed production in grasses consists of the appearance of heads, the dispersal of pollen and the maturation of seed. But these are only the more advanced stages in seed development. A full understanding of the complete process is basic to the successful management of grasses for seed production. In view of the importance of the grass seed industry in northwestern Canada, we at the CDA Research Station, Beaverlodge, Alta., are conducting experiments to determine the various factors that influence all stages of the phasic development of grasses.

It has long been known that a feature common to all perennial grasses is the sequence of stages through which an individual tiller passes in producing a seed head. Each tiller originates as a minute enlargement on the crown of the plant but soon becomes a vegetative shoot with leaves and roots. Under favorable conditions the growing point, after producing several leaves, undergoes chemical change (induction) in preparation for flowering. The next stage (initiation) is the morphological transformation of the growing point from the vegetative (Fig. 1) to the floral state (Figs. 2, 3 & 4) with the rudimentary floral parts appearing as small protuberances. Only then does heading and development of seed occur.

Although grass species follow the same sequence of phasic development, the environments required to promote the successive stages differ considerably. The stages at which the plants are receptive to these stimuli also vary. For example, the induction of creeping red fescue is completed in late autumn, but only in those tillers with one full season of uninhibited growth. Because of this, spring seedings made without a companion crop usually produce seed the following year, while those sown with such a crop or alone in mid-summer do not. Floral initiation occurs in the spring shortly after the spring thaw, some 5 to 10 days prior to that of most other species. By controlling the environment, we found that creeping red fescue requires a period of long days and low temperatures for floral initiation. If spring temperatures rise too rapidly in relation to lengthening daylight, floral initiation does not take place. For this stage of flowering, northwestern Canada provides the required spring climate.

Intermediate wheatgrass also is autumn induced, but a week or two earlier than creeping red fescue, indicating that this species does not require such low temperatures and short days as does fescue. Intermediate wheatgrass is somewhat unique in that induction can be acquired also by moistened seeds (seed vernalization) and by very young tillers. Therefore, it is not uncommon to find tillers in the early autumn with initiated floral parts. However, tillers initiated in the autumn are killed during the winter and the seed crop is from induced tillers that undergo initiation in the early spring.

Russian wild-rye differs from most other cultivated species in that seed is produced by tillers which pass

Dr. Elliott is a specialist in forage crops at the CDA Research Station, Beaverlodge, Alta.

factors

Fig. 1—The growing point of a creeping red fescue tiller in a vegetative stage

Figs. 2, 3 & 4—The growing points of creeping red fescue tillers in successive stages of floral initiation prior to stem elongation

through the floral initiation stage in the early autumn of the previous season. We also noted that initiation occurred only in those tillers that had previously overwintered in the vegetative stage. This explains why new seedings of Russian wild-rye do not produce seed until after the second winter.

These precise species differences dictate the management practices that must be followed for commercial seed production. For example, grasses in which young tillers invariably undergo autumn induction can be seeded in the spring with a companion crop or alone in midsummer. Time of applying fertilizer is also important. We have found that floral initiation has very specific requirements for nitrogen, so seed growers should apply supplemental nitrogen just prior to this stage. For those grasses, such as creeping red fescue, that initiate heads in the early spring, late autumn fertilizing is most effective. For those that initiate floral parts later than creeping red fescue, such as bromegrass, intermediate wheat grass and timothy, fertilizing may be delayed until the early spring. For Russian wild-rye, fertilizing immediately after seed harvest is best.

This knowledge can reduce by two-thirds the time required to produce seed from the initial crosses in a grass breeding program. At Beaverlodge we determined the light and temperature requirements for each stage for creeping red fescue, bromegrass and intermediate wheatgrass. These grasses, under controlled climates, can be grown through one complete life cycle in 8 months as compared to 24 months for fieldgrown plants.

Fig. 5—Harvesting a portion of the 20-million pound crop of creeping red fescue seed produced annually in Canada's Peace River region

affecting grass seed yields

winter wheat losses caused by streak mosaic

T. G. ATKINSON AND M. N. GRANT

Losses caused by a severe outbreak of streak mosaic in southern Alberta's 1963-64 winter wheat crop emphasize the importance of controlling this disease. Field studies we carried out during this outbreak provide the first detailed evaluation of the losses that can occur in a crop infected by streak mosaic.

In our investigations at the CDA Research Station, Lethbridge, Alta., we used two approaches in disease-loss studies. An extensive acreage survey indicated the general severity and extent of the outbreak. In a more detailed study of one farmer's infected crop, disease evaluations and yield determinations were made on more than 2,500 plants. This information revealed a clear-cut relationship between disease intensity and yield and showed how streak mosaic affected several yield components.

Acreage reports which were obtained from over 1,000 growers, represented about 71 per cent of the 188,000 acres of winter wheat that the Dominion Bureau of Statistics estimated were sown in Alberta during the fall of 1963 (Table 1). These reports indicated that about one quarter of the crop was infected with streak mosaic. About two-thirds of the diseased crop was cultivated out because of severe damage and to prevent spread of the disease to spring-sown crops (Fig. 1).

The disease-distribution map prepared from these acreage data illustrates the danger of sowing winter wheat before nearby susceptible spring crops have ripened (Fig. 2). The streak mosaic outbreak was restricted to that part of the winter wheat growing area where spring wheat and barley crops matured unusually late in 1963 because the weather earlier in

---

Dr. Atkinson is a Plant Pathologist and Dr. Grant is a Winter Wheat Breeder at the CDA Research Station, Lethbridge, Alta. A fuller account of these investigations appeared in *Phytopathology*, February, 1967.

Fig. 1—Severely diseased winter wheat was turned under in the spring

the season delayed their development. Mites present on some of these immature crops carried the streak mosaic virus to early-sown winter wheat where both the virus and the mites multiplied rapidly. The disease then spread to later-sown crops during an unusually warm and extended fall.

The acreage reports also provided a basis for figuring out the losses to winter wheat caused by the streak mosaic outbreak. We estimated that healthy crops averaged 30 bushels per acre and that an average reduction of 10 bushels per acre was caused by the disease. Both estimates were considered conservative by the various scientists and District Agriculturists who were actively involved with the streak mosaic problem. Based on these calculations, winter wheat losses for the acreage surveyed exceeded 700,000 bushels, or 18 per cent of the potential yield. These losses would have been greater had not growing conditions in 1964 been ideal.

To obtain a more accurate evaluation of the effect of streak mosaic on yield, a detailed study was carried out on a 24-acre naturally-infected winter wheat crop in the Lethbridge area. Plants collected in a systematic sampling of the crop in May fell into three distinct disease categories, "severe", "stunted", and "healthy" (Fig. 3A) These categories could also be recognized when yield samples were collected at maturity (Fig. 3B). Under the prevailing growing and disease conditions, yield from this crop was directly

Fig. 2—Localization of the 1963-64 streak mosaic outbreak in southern Alberta

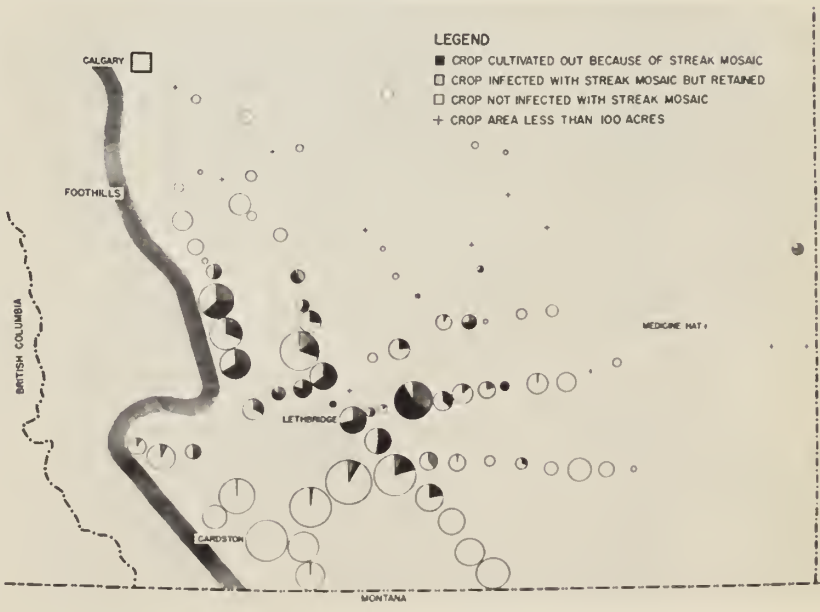


Fig. 3—"Severe" "stunted" and "healthy" classes of winter wheat. (A) as they appeared in May. (B) at maturity

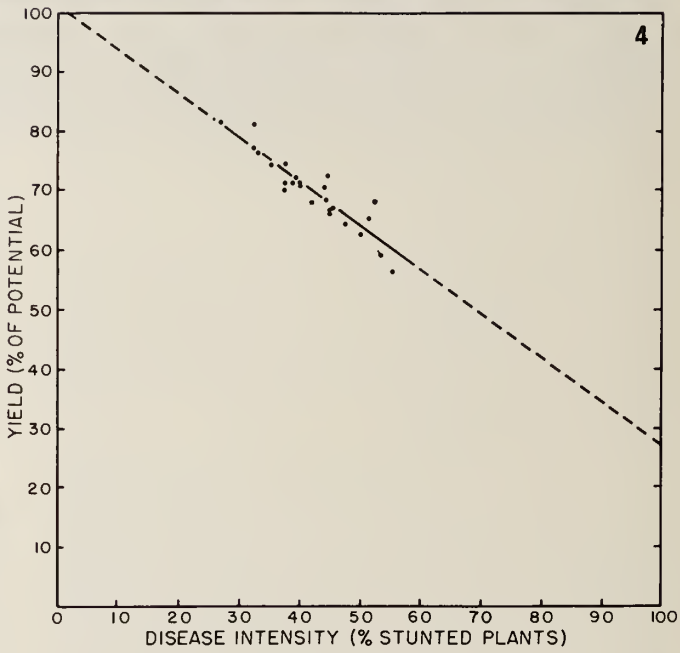
Fig. 4—Relationship between disease intensity and yield found in a streak mosaic infected crop

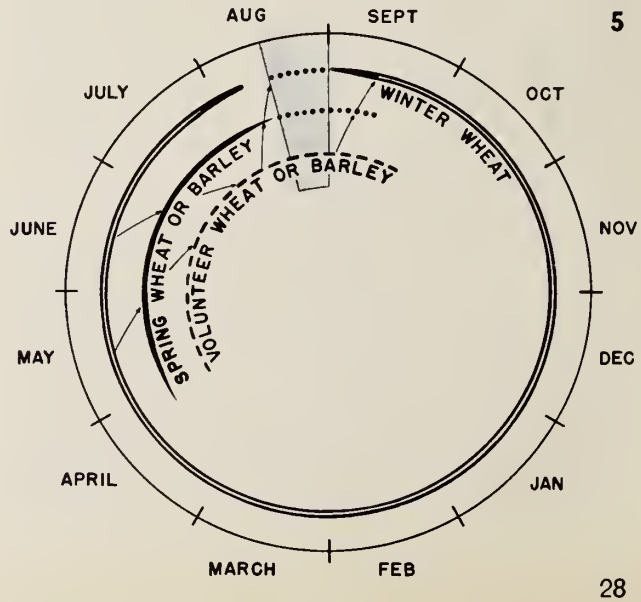
Fig. 5—Wheat streak mosaic disease cycle. Control depends on preventing an overlapping sequence between spring hosts and winter wheat. Shaded area: period during which effective control is normally achieved. Dotted lines: problems presented by early-seeded winter wheat and/or late maturing spring wheat or barley. Arrows: transfer of virus by wind-blown mites

related to the percentage of plants classified as stunted (Fig. 4). The stunted plants yielded 72 per cent less than the healthy ones, while those severely stunted died without producing seed.

The relationship between disease intensity and yield derived through this detailed study supports our estimate of an average yield reduction of 10 bushels per acre caused by streak mosaic during this outbreak. The reduced yield, equivalent to 66 per cent of the estimated potential yield of 30 bushels per acre, indicated an average disease intensity of 46 per cent (Fig. 4). Since the crop we sampled had an average disease intensity of 42 per cent and appeared less severely affected than most of the diseased crops in the winter wheat area, our yield reduction estimate appears reasonable.

Our studies revealed the effect of streak mosaic on certain yield components. Stunted plants averaged only 34 kernels per plant compared with 96 for healthy plants. Sieve-sizing the kernels from healthy and diseased plants also revealed striking differences in the composition of the grain samples. Not only did stunted plants produce a higher percentage of small kernels but also the weights of kernels from these diseased plants were less than those of similar-sized kernels from healthy plants (Table 2).





LOSSES FROM STREAK MOSAIC CAN BE AVOIDED

Streak mosaic in Canada was first reported in 1952 from southern Alberta where it was identified as the disease that had yellowed and stunted winter wheat for many years. It was later found in the winter wheat growing area of southwestern Saskatchewan and, in 1964, was found for the first time in southwestern Ontario.

Both the streak mosaic virus and the tiny mite that carries it require a continuous, year-round supply of living host plants. The occurrence of streak mosaic only in the winter wheat growing areas of Canada illustrates the importance of winter wheat in carrying the virus and mites over winter. Preventing the infection of winter wheat in the fall is the key to controlling this disease.

The accompanying diagram illustrates how windblown mites, from winter wheat infected the previous fall, carry the virus to spring wheat and barley crops as well as to volunteer growth (Fig. 5). If the next winter wheat crop emerges before these spring crops have ripened or before volunteer growth has been destroyed, the cycle to winter wheat can be completed. The disease is simply, yet effectively, controlled by breaking this cycle.

In southern Alberta, winter wheat should normally be sown during the first two weeks of September to develop maximum winter hardiness. At this time susceptible spring crops are usually mature. Streak mosaic control then depends upon killing all volunteer wheat and barley prior to seeding winter wheat.

- DESTROY VOLUNTEER WHEAT OR BARLEY BEFORE SOWING WINTER WHEAT ON THE SAME OR ADJACENT FIELDS.
- SEED WINTER WHEAT ONLY AFTER NEARBY SPRING WHEAT AND BARLEY CROPS ARE HARVESTED OR MATURE.

TABLE 1—SUMMARY OF WINTER WHEAT ACREAGE REPORTS FROM 1,103 GROWERS

Crop	Acres
Sown in 1963	133,605
Showing streak mosaic symptoms	31,432
Cultivated out	20,096

TABLE 2—PHYSICAL CHARACTERISTICS OF GRAIN FROM HEALTHY AND STREAK MOSAIC INFECTED WINTER WHEAT

Kernel size category	Composition of sample		1,000-kernel wt.	
	Healthy	Diseased	Healthy	Diseased
	Per cent	Per cent	Grams	Grams
1 (largest)	77.1	33.1	33.9	29.1
2	14.5	26.6	25.3	24.1
3	7.3	33.1	19.4	18.9
4 (smallest)	1.1	7.2	13.1	11.3

ERRATUM NOTE

On page 32 of CANADA AGRICULTURE (Spring '67) photographs showing symptoms of bacterial wilt of alfalfa and spring and black stem diseases of alfalfa, were included in error. We regret that the illustrations were not withdrawn at the time the author revised his article and sincerely apologize for the oversight.

Fig. 6—Streak mosaic symptoms. Left: healthy leaf

developing late fruiting strawberry varieties...

FOR CANADA'S ATLANTIC REGION...

D. L. CRAIG AND L. E. AALDERS

Strawberries are an important crop in Canada's Atlantic region where the CDA Research Station at Kentville, N.S., has several promising selections on test. Although only a few growers specialize in strawberry production, many farmers cultivate a small acreage for quick early season cash.

WHAT GROWERS NEED

To expand their export trade, strawberry growers of this region need new, productive, late-maturing varieties that will produce large attractive and firm berries of good flavor.

To do so, the problems to be overcome are season of ripening, fruit size, and sufficient firmness for the export trade.

Season of ripening is very important. Early fruiting varieties such as Redcoat overlap supplies already on the export markets. Prices at this time do not attract our growers. They need a variety as late as, or later than Sparkle. In 1966, the export market strengthened after July 15, at which time most of our varieties had passed their production peak.

Fruit size is also a problem, especially with the variety Sparkle. One third or more of its crop may fail to obtain sufficient size for an attractive pack; yet, at present, it is our principal export variety.

Lack of sufficient firmness for the export trade is the major weakness of all of our presently grown varieties. It takes 12 or more hours of steady driving for trailer trucks to reach the Boston market from some of our production areas. Berries sent by truck on this journey that are not firm to start with cannot possibly arrive on the market in good condition. What is needed for the export trade are varieties as firm as the California variety, Tioga, or the variety Florida-ninety. Last but not least, attractiveness and quality must be considered. Some people tend to ignore quality but we believe that sooner or later the buyer is going to demand both quality and appearance.

OUR BREEDING PROGRAM

We started to breed strawberries at Kentville in 1950. Our program was, and still is small in comparison to those at some other plant breeding centers.

Dr. Craig is head of the Small Fruits Unit and Dr. Aalders is a specialist in cytology and genetics—both with the CDA Research Station, Kentville, N.S.

Our first objective in the early 50's was simply to produce better varieties. One of our crosses between Redcrop and Sparkle yielded many good seedlings. Acadia, which we named in 1965, was from this cross.

In the mid 50's, an additional objective was added to the program, namely, the development of breeding techniques. These involved the inbreeding of this normally cross-pollinated crop and to date has included over 80,000 field-grown seedlings. Both programs are still underway with new emphasis on variety crossing.

OUR BREEDING METHODS

One of the most perplexing things for the strawberry breeder is to know that all the desirable characteristics are present in the great number of varieties now available to him for his breeding program. The problem is to accumulate them in one variety. This becomes more complex when one realizes that the strawberry is a very heterozygous plant. All you need to do is save the seed from a few berries, germinate them and then grow the seedlings until they produce fruit, and you will note that each and every one is different. Probably none is as good as the variety that produced the seed. This is the reason varieties are propagated from runner plants.

A further complication is that the desired improvements are generally quantitative in nature. Factors such as fruit size, firmness, color and yield are not simply inherited like the height of garden peas. So we must grow large populations in our search for the one that is just a little bit better.

We do our crossing in the greenhouse during the winter months. The choice of parents is based on their breeding behavior and we determine this by making test crosses. For example, in 1963 we used the late-fruiting, German variety, Senga Sengana, as a female parent and pollinated it with 7 late-fruiting varieties. Eighty plants from each cross were fruited in field plots. Careful examination of each individual plant established the best combinations. All that remained to be done was to repeat the best crosses and grow as many seedlings as possible. With our

Fig. 1—Pollinating Redgauntlet with Tioga pollen

Fig. 2—Strawberry seedlings ready for field planting

Fig. 3—Strawberry seedling test plots

facilities, this generally amounts to 1,000 seedlings per cross.

It has been our experience that one cannot predict the value of a variety as a parent on general appearance alone. Those we felt should be good produced nothing of value, so the use of small test crosses can save needless effort. Valentine and Catskill are examples of good and poor parents.

Few people realize that the minimum time from the first strawberry cross to the year of introduction is at least 10 years. The reason for this time lag is the number of seasons a selection must be tested before it can be released. A pitfall in strawberry breeding is to become too optimistic following the first fruit test. Almost invariably, it happens that the seedling will not appear nearly as promising on the second test. This variation is the plant's response to a different set of environmental conditions. A selection must be fruited 4 to 5 times if we hope to secure a good measure of its ability to be a reliable producer. Selections that give a good average response may be expected to be better adapted to a wide geographical area than one that is outstanding one year and poor the next.

Among the promising selections we have on test is K60–98. We have also added new breeding material to our program: Tioga from California because of its firmness, berry size and attractive color; Redgauntlet from Scotland because of its upright fruit stalk, resistance to fruit and root diseases, lateness and productivity; Vesper from New Jersey because of its lateness and berry size, and many others. We hope that these additions to our parental breeding stock will enable us to produce the variety that will capture new markets for Atlantic Region strawberry growers.

THE VARIETY PICTURE

Twenty years ago, virtually all of our growers concentrated on the varieties Senator Dunlap and Premier. Although these could be depended upon to give at least a moderate crop, we could not establish an expanding trade on them. In recent years, virus free stocks of newer and better varieties have become available. Redcoat and Sparkle now make up the bulk of our plantings with smaller amounts of Cavalier, Surecrop, Catskill and Guardsman being grown. These varieties grow extremely well in the Atlantic region and total production for the area was estimated to be more than 4½ million pounds in 1966. Total farm value exceeded $1 million.

Fresh fruit markets in the Atlantic region are normally well supplied with local strawberries. Much of Prince Edward Island's production goes into a frozen pack. Any expansion of the industry will require either more berries frozen, or the development of an export trade. The Atlantic region is favorably suited for the development of an export trade since late maturing varieties are harvested here when all other principal strawberry growing areas have ceased production. This fact has encouraged our growers to take a careful look at the potential of the New England, New York, and Canadian fresh fruit markets. Approximately 35 per cent of the total U.S. population, and 50 per cent of Canada's population live within a 1,000-mile radius of the center of our production area. Trial shipments to Boston and New York during the past few years have indicated that there is a large and ready market for our fruit if we can supply a good quality late season pack. It is on the point of season and quality that we at the Kentville Research Station believe a contribution can be made through plant breeding.

Presently, about 3 per cent of the Nova Scotia strawberry crop is exported to New England as fresh fruit. Sparkle is the chief export variety, but it falls far short of the mark as an ideal export type. It is too soft, too small, and for some of our areas, not late enough in maturity.

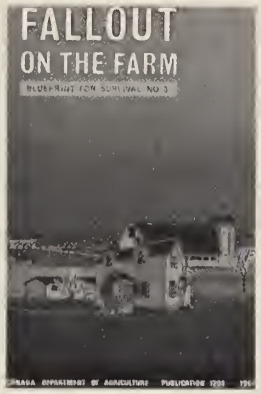
Fig. 4—Acadia strawberry from a Sparkle X Redcoat cross, introduced in 1965

Fig. 5—K-60-98 is a promising selection

PUBLICATIONS

Copies of these, and a list of other publications may be obtained free of charge (unless otherwise stated) from: Information Division, Canada Department of Agriculture, Ottawa.

On peut obtenir gratuitement (à moins d'avis contraire) des exemplaires de ces publications ainsi qu'une liste d'autres publications à: la Division de l'information, ministère de l'Agriculture du Canada, Ottawa.



1208—FALLOUT ON THE FARM 24 pp. Third edition of a publication of value to every farmer.

1208—RETOMBÉES RADIOACTIVES SUR LA FERME 28 pp. Faits—Dangers—Protection.

1272—RABIES AND LIVESTOCK (folder). Complete description of this highly contagious disease in all classes of livestock.

1272—LA RAGE ET LES BESTIAUX (dépliant). Description de la maladie. Prévention.

1260—HANDBOOK ON THE STORAGE OF FRUITS AND VEGETABLES FOR FARM AND COMMERCIAL USE 52 pp. Bulk storage requires careful control of temperature and humidity.

1260—L'ENTREPOSAGE DES FRUITS ET DES LÉGUMES À LA FERME ET DANS LE COMMERCE 65 pp. Conditions d'entreposage appropriées à une grande variété de fruits et de légumes.

1263—RABIES AND YOUR PET (folder). Protect your family by controlling your pets and knowing the symptoms of this incurable disease.

1247—DISEASES AND PESTS OF TURFGRASS IN THE PRAIRIE PROVINCES 12 pp. Good lawns are frequently marred by disease. Suggestions are given for recognition and control.

1306—CONTROL OF THE CORN EARWORM 8 pp. The corn earworm attacks sweet corn in every province. Early control is necessary for a good quality product.

1263—VOTRE ANIMAL FAVORI ET LA RAGE (dépliant). Comment reconnaître la maladie. Comment en prévenir la propagation.

1299—L'INOCULATION DES LÉGUMINEUSES. Nécessité et technique.

1306—RÉPRESSION DU VER DE L'ÉPI DU MAÏS 8 pp. Description—Dommages. Répression chimique. Répression naturelle.

CANADA AGRICULTURE